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Figure 1. Bonito being prepared for salting at Môle St. Nicolas, Haiti. This work normally takes place after dark. The standards for the hurricane lamps can be seen on the table.



Figure 2. This photograph shows a few of the bales of dried bonito produced during the salting and drying experiments at Môle St. Nicolas (see pp. 142-43).
(Photos by M. Routh)

FISHERIES PRODUCTS FOR TROPICAL CONSUMPTION¹

Introduction

(Progress Report from Working Group 1, FAO Interim Committee on Fish Handling and Processing, presented at the FAO Fish Processing Technologists Meeting, Rotterdam, the Netherlands, from 24 to 29 June 1956)

One of the recommendations of the FAO Meeting on Herring Technology held in Bergen, Norway, in 1950, was that a study be undertaken on the possibilities of developing new or improved fisheries products in Europe and North America, which might find acceptance by the protein-needy populations in Africa and Asia. When, at the same meeting, the FAO Interim Committee on Fish Handling and Processing (renamed the FAO Liaison Committee on Fishery Products Technology in 1956) was established, the subject was assigned to a Working Group under the chairmanship of one of the authors (C.L.C.) of this paper, which is a report on the information collected. It includes data compiled in an earlier report by Cutting and Hamley (3), as well as information assembled after 1953 when the second author (K.B.), acted as Chairman of the Group. The paper, therefore, is a summary of all the information collected by the Working Group to date.^{2,3}

The first step taken by the Working Group was to conduct a survey of the food habits of native populations in tropical countries and territories, and to learn something of their taste in fish products, how their needs are met by domestic production and imports, and at what prices. Much information has been collected on the types of fish products at present eaten in these tropical areas, on their origin, and on the methods of curing. This information has been gathered from group contacts, published literature, and answers returned to a questionnaire sent to various group contacts and to the British Colonial Office, which distributed the questionnaire to Colonial Fishery Officers. This background information was presented to members of the Working Group at a meeting in Hull in 1953. The following is a summary of the information collected.³

¹ By C.L. Cutting, Humber Laboratory, DSIR, Hull, England, and Kaare Bakken, Norwegian Fisheries Research Institute, Fisheries Department, Bergen, Norway.

² Statistical data appearing in earlier reports have been revised in the light of the latest information compiled by the Economics and Statistics Branch, FAO Fisheries Division.

³ Liberal use has also been made of the information concerning Asiatic countries, contained in FAO Report No. 404, *Report on the First FAO/ETAP International Fish Marketing Training Center, Hong Kong 11 July-31 August 1954*.

I. Equatorial Territories

East Africa (Tanganyika, Kenya, Uganda and Zanzibar)

Most of the fish eaten in these areas are dried, or dried and smoked. Only in some of the coastal areas of Kenya and Zanzibar and in the neighborhood of the lakes is fresh fish available. Dried fish are imported from the Arab fishing areas further up the coast and from the Gulf of Aden.

The wholesale price is between 1s. and 3s. per kg. In the lakes, considerable amounts of fresh-water clupeids are caught.

TABLE 1 — IMPORTS : FISH, DRIED, SALTED OR SMOKED

	1938	1949	1950	1951	1952	1953	1954	1955
	metric tons							
Tanganyika	736	1 383	1 060	1 396	1 397	1 213	1 653	1 933
Kenya*	662	442	395	305	357	337	439	668
Zanzibar and Pemba	872	1 886	2 015	2 258	1 610	1 397	—	—

*includes Uganda

The fish are sun-dried or salted, and part of the production is exported to the Belgian Congo.

The natives usually cut the dried fish into small pieces before boiling or stewing, and it is then eaten with a cereal dish ; or the fish are cooked as a highly flavored relish for use in a cereal or vegetable dish. Salted fish are not usually consumed, although there seem to be no objections to such a product.

Southeast Africa and the Rhodesias (Mozambique, Nyasaland, Northern and Southern Rhodesia)

The taste preference is for fresh and dried fish. In Northern Rhodesia and Mozambique, herring-like fishes account for about 50% of the consumption. Dried herring is imported from Angola, and the retail price is about 2s. per kg. Dried hake is imported from the Union of South Africa. Fish meal is used for livestock feeding in some parts of Southern Rhodesia, and is imported from South Africa. Fish are prepared as a relish or stew to be added

to a basic cereal dish. The Rhodesian natives are most conservative in their food habits, and prefer fish to be sold with the head (a taboo) or to be prepared as a meal or flour.

TABLE 2 — IMPORTS : FISH, FRESH, CHILLED OR FROZEN

	1938	1949	1950	1951	1952	1953	1954	1955
	metric tons							
Mozambique.....	85	345	272	273	345	435	410	446
Northern Rhodesia ^{1,2}	110	554	279	352	404	357	—	—
Southern Rhodesia ^{1,2}	372	830	1 203	1 429	1 213	1 349	—	—
Rhodesia and Nyasaland, Federation of ¹	—	—	—	—	—	—	1 818	2 332

¹from 1 January 1954 = Federation of Rhodesia and Nyasaland

²includes cured fish

³includes crustaceans and mollusks

TABLE 3 — IMPORTS : FISH, DRIED, SALTED OR SMOKED

	1938	1949	1950	1951	1952	1953	1954	1955
	metric tons							
Mozambique.....	1 055	1 729	1 743	2 189	2 305	3 104	3 430	2 779
Southern Rhodesia ^{1,2}	306	916	1 367	1 387	1 472	1 541	—	—
Rhodesia and Nyasaland, Federation of ¹	—	—	—	—	—	—	2 084	2 195

¹from 1 January 1954 = Federation of Rhodesia and Nyasaland

²includes crustaceans and mollusks

TABLE 4 — IMPORTS : FISH IN AIRTIGHT CONTAINERS

	1938	1949	1950	1951	1952	1953	1954	1955
	metric tons							
Mozambique.....	348	195	266	386	428	284	376	509
Northern Rhodesia ¹	52	98	142	145	201	158	—	—
Southern Rhodesia ^{1,2}	319	328	638	626	687	571	—	—
Rhodesia and Nyasaland, Federation of ¹	—	—	—	—	—	—	1 110	1 426

¹from 1 January 1954 = Federation of Rhodesia and Nyasaland

²includes crustaceans and mollusks

French Equatorial Africa and the Belgian Congo

As a whole, these areas consume very little animal protein. Fish are popular, and the predominant taste preference is for dried, and dried and smoked forms. Acceptability tests in the Cameroons have shown that 95% of the population like fish and fish flour. Consumption of dried fish is high on the Ivory Coast: large quantities of fish are caught in the North Cameroons and in the Lake Tchad area. In recent years there has been a gradual increase in consumption of dried, salted fish imported from Uganda and the Sudan. Dried and smoked fish of the herring type is imported from the Canary Islands and Angola. Dried fish are also imported from Mauretania into the Belgian Congo.

TABLE 5 — IMPORTS : FISH, DRIED, SALTED OR SMOKED

	1938	1949	1950	1951	1952	1953	1954	1955
	metric tons							
Belgian Congo and Ruanda Urundi	*7 672	14 866	19 404	24 327	26 311	22 321	23 894	24 089
French Equatorial Africa.....	1 964	2 823	3 681	4 561	4 856	5 479	5 746	6 297

*1938 excludes Ruanda Urundi

The local population is known to be extremely conservative in its food habits, although recently acceptability tests carried out with fish sauce in the Cameroons might indicate that some of the native population at least might be encouraged to change their food habits. There seems to be a market for dried herring products, and possibly also for herring meal, but only if the price is very low.

West Africa (Ghana, British and French Territories)

The most important of the fishes caught in this area are the herring-like fishes, such as the sardinella in Ghana, and the bonga (*Ethmalosa*) from Senegal to Angola. In West Africa, fishing is mostly done by hand-lines and is carried on all the year round. Fishing for clupeids is seasonal. It extends over a 3- to 5-month period and is largely dependent on the activities of nomad fishermen (Fante fishermen) who range along the coast from Liberia to the Congo river. These fishermen smoke bony and bonga.

On the west coast, consumption of fresh fish is limited by the extent to which roads are available for transportation and distribution. Most of the fish consumed is marketed in dried, and dried and smoked forms. Tremendous losses (as much as 30% on occasion) are experienced as a result of insect infestation,

and there is a considerable amount of spoilage from mold growth, which is favored by high temperatures and humidity.

Gambia, however, is an exception. Here 85% of the fish consumed is fresh. In the United Kingdom, experiments have also been carried out on smoking and drying unsalted herrings, with a view to assessing their marketability in British West Africa. Smoked and dried fish weighing 3 to 4 oz. were sold in Nigeria at about 1½d. to 3d. each (about 7½d. to 1s. 3d. per lb.), and

TABLE 6 — IMPORTS : FISH, DRIED, SALTED OR SMOKED

	1938	1949	1950	1951	1952	1953	1954	1955
	metric tons							
French West Africa.....	1—	47	62	107	92	99	144	—
Ghana ²	2 660	1 569	2 717	3 922	5 646	4 240	3 799	3 787
Nigeria.....	10 368	2 355	3 584	8 212	13 204	15 501	23 483	21 741

¹included with fish canned

²includes crustaceans and mollusks

in Sierra Leone at 2d. to 6d. each. There has been a trial production of sardinella fish meal in Ghana, and of fish sauce (Nuoc mam) in Senegal. Both products were well received by the natives. It is likely that dried herring products would find a market in these areas. Salted products are generally not favored. Unsalted, hot-smoked and dried herring, resembling the bonga produced in Ghana, should be a feasible product, also unrefined herring meal. As the relative humidity is very high (80 to 90%), one of the difficulties will be to find a suitable packaging material.

The imports of stockfish from Norway and Iceland into Nigeria have increased steadily in postwar years.

India

The availability of fish at present is very low, less than 2 kg. per capita per year. The population of nearly 400 million people represents a vast potential market. In 1955, the total catch was estimated at 839,000 metric tons. The clupeids, in almost equal portions of herrings and anchovies on the one hand, and Bombay Duck on the other, accounted for about 28% of this total. Some 26% of the catch was sun-dried, and about 25% salted. Imports of preserved fish in 1953/54 were about 4,000 tons, valued at Rs. 6 million (about 1s. 6d. per kg.).

The preference is for fresh fish, especially fresh-water fish. Dried and salted fish are used by the poorer people and prices are very low.

Pakistan

The per capita annual consumption is estimated at $2\frac{1}{2}$ kg. Most of the fish are sold fresh, some are salted and some dried. Of an estimated total catch of about 270,000 metric tons in 1955, some 40,000 tons consisted of clupeids. The greater portion of the catch is fresh-water fish. A large portion of the marine catch consists of sharks, skates, etc.

Ceylon

Fish, both fresh and preserved, are an important food here. About half the amount consumed is imported, principally as dried, salted fish from Aden, India, Maldiv Islands, Muscat and Pakistan.

TABLE 7 — IMPORTS : FISH, DRIED, SALTED OR SMOKED

	1938	1949	1950	1951	1952	1953	1954	1955
	metric tons							
Ceylon *	23 838	33 054	32 009	36 794	37 866	27 171	26 881	28 685

*1938, 1949-52 includes " Prawns and sprats, dried "

In 1953, about 39,000 tons were imported, at a value of Rs. 58 million (about 2s. 3d. per kg.). The fresh fish, which are marketed, are often in a very bad condition, but the consumer taste appears to be adjusted to it. The availability of fish is about 10 kg. per capita.

Burma

Fisheries in this country are chiefly inland fisheries, mainly in the Irrawaddy Delta. Inland consumers, therefore, are rather unfamiliar with marine fish and there is some prejudice against consumption of such fish. The fish which are not sold fresh are either dried or made into fish paste. A peculiarity of Burma's taste is the liking for "stale" dried fish. This is fish that is cut open, gutted, allowed to spoil and then dried in the sun. Some 5,000 tons of fish are imported annually. This consists mainly of canned sardines from Japan, which are very popular. The average per capita consumption is about 5 to 6 kg. per annum.

Malaya and Singapore

On the west coast of Malaya, the density of the population ensures a steady demand for fresh fish, and there is a plentiful supply of ice. On the east coast, the fisheries depend upon export to or via Singapore. The most important types here are mackerel (ikan kemborg [*Rastrelliger*], a low-priced fish much in demand by

Malaya's laborers and farmers), and sardine types such as sprats and anchovies. These small species are in little demand on the west coast, and the greater part of the catches are salted and

TABLE 8 — IMPORTS : FISH, DRIED, SALTED OR SMOKED*

	1938	1949	1950	1951	1952	1953	1954	1955
	metric tons							
Malaya and Singapore.....	51 957	10 915	22 603	41 317	43 306	29 604	16 437	15 954

*includes crustaceans and mollusks, dried, salted or simply cooked

exported via Singapore to Indonesia. The import trade into Malaya of cured fish, which amounted to 52,000 tons before the war (1938), was less than 11,000 tons in 1949, but expanded again with fluctuations due to increased supplies from Thailand, coupled with an increased demand for exports to Indonesia. Cambodia, Laos and Viet-Nam, important prewar importers to Malaya, have not

TABLE 9 — EXPORTS : FISH, DRIED, SALTED OR SMOKED*

	1938	1949	1950	1951	1952	1953	1954	1955
	metric tons							
Malaya and Singapore.....	52 965	6 245	15 421	31 395	41 409	28 475	12 334	4 993

*includes crustaceans and mollusks, dried, salted or simply cooked

been in a position to expand these quantities to the prewar level of their exports, and Malaya has had to be dependent largely on supplies of dried and salted fish from Thailand. Much canned fish is imported (and partly re-exported) from the U.S.A., the United Kingdom, and the Union of South Africa. The country has shown interest in fish meal for human consumption.

Indonesia

The existing level of fish consumption is regarded as far too low (about 8 kg. per capita per annum). The imports of fish and fish paste in 1953 amounted to 40,000 tons. Canned sardines were imported from Japan and the U.S.A. Owing to exchange difficulties the imports are restricted. The most important of the marine fishes caught in Indonesia are anchovies, carangids and mackerels. About 75% of the catch is cured. The methods of curing are drying, salting and the manufacture of fish paste. Imported salted and dried, loosely-packed Asian species, of the same variety as those caught and cured in Indonesia, are popular.

Thailand

Thailand, compared with many other countries in the Far East, is well supplied with fish (per capita consumption is about 18 kg. per annum), but still there is a shortage of protein food, especially in the northeastern part of the country where several million people live on the border of starvation.

A small mackerel called Pla thu (*Rastrelliger*) is the most important fish, as well as the most important of the lower priced animal protein foods available to the poor. The chief methods of curing are salting and drying, and the manufacture of fish sauce (Nam pla). The manufacture of shrimp paste (Kapi from planktonic and semi-planktonic crustaceans) is another important industry. The main export product is Pedah siam (salted, partially fermented and half-dried Pla thu).

Cambodia and Viet-Nam

The manufacture of Nuoc-mam and other cured fish products in Indo-China is well known from numerous publications (4) and will not be discussed here. The fisheries in Cambodia are mainly the fresh-water type. There is a considerable export of fresh, salted and dried fish to Viet-Nam, where they constitute an important source of protein for the generally undernourished population.

The Philippines

This country is relatively well supplied with fish from its own fisheries, and from imports (mainly canned sardines from the U.S.A.). The per capita consumption in 1953 was about 18 kg. (the average consumption necessary to meet the nutritional requirements is calculated at about 25 kg. per capita per annum). Anchovies, mackerel and herrings rank first among the fisheries. "Bagoong" (fish paste) is the most important of the processed products. Other methods of preservation are salting and drying, smoking and canning.

Borneo

Fish is also a staple food in this area. As in other countries surrounding the South China Sea, herring-like species are the most important. Pomfrets and tread-fins are most popular, but clupeids are much in demand. Sarawak and North Borneo export some of their surplus fishes. Sarawak has shown interest in erecting a reduction plant for production of fish meal from low-priced fish for animal use, and for fertilizer and possibly human consumption.

The fishing in this area is still on a subsistence level ; however, it is believed that abundance of *Rastrelliger* and sardinellas are to be found in coastal waters. Although there is no organized marketing of fish, there seems to be no lack of protein among the population, except in the interior. The domestic methods of fish preservation seem to be salting and smoke drying.

Regarding the South China and Java Seas as a whole, fresh fish and especially cured fish are important and popular and often are the only available sources of animal protein. As herring-like fish are the main raw materials for the curing industry, there is no doubt that similar products manufactured from European and North American clupeids could be produced, but the possibilities of marketing fisheries products in these areas, even low-priced products, seem at present rather doubtful.

II. Possible Products

Dried, and Smoked and Dried Herring Products

In tropical countries, it is not an uncommon practice to dry whole, ungutted fish without previous salting. The methods involve sun-drying and fire-drying (hot-smoking and drying) and combinations of these. Curing by salting and drying is carried on to a limited extent.

The smoked, dried product, which in Africa is often grilled at the start of the process, is usually of a very dark color and has a strong odor. It is not very attractive except to the local people. Samples of Nigerian dried fish submitted at the meeting in Hull showed water contents from 13 to 16%, oil contents varying from 2 to 10%, and a salt content of about 2 to 3%. There was no doubt that acceptable replicas of the more oily samples could be produced from herring, but so far as is known, manufacture of bonga-cured herring has only been carried out on a laboratory scale. The factors affecting the rate of drying of herrings, particularly in filleted form, have already been discussed (2). In Norway, wind-drying of herring for domestic consumption, without salting or smoking, is commonly practiced along the west coast during the winter. Favorable climatic conditions make it possible to dry herrings in this way without putrefaction. In 1955, one firm started experiments on a semi-industrial scale by wind-drying whole, unsplit, spawned, winter herring. The drying period was about 3 months. The yield of dried product was about 30%, indicating that a water content below 15% had been reached. Some tons of this product have been sent to West Africa for acceptability testing, and for examination of keeping properties.

Some rancidity, which develops in the product and which is not very pronounced, seems to be no objection, and the product has been well received. With a retail price of 2*d.* to 3*d.* per piece, the manufacture of wind-dried herring might be a feasible industry in the more northern countries.

Fermented Products

There is extensive literature dealing with fermented products in the Far East. It includes descriptions of methods of manufacture and studies of processes and products. Naturally, all the cured products in these hot and humid areas have undergone some degree of fermentation. To what extent special bacteria are responsible for the characteristic taste and flavor of the different products does not seem to be clear. The manufacture of fermented products seems to be limited to the Java/South China Sea areas, though similar products are not quite unknown in other countries. In Scandinavia, fermented fresh-water trout (*rak-ørret*) in Norway, and Baltic Herring (*sur-strömming*) in Sweden, are well-known products, highly valued by a few, but quite repulsive to most people.

The most pronounced fermented products in the Far East are the various autolysate liquids (Nuoc mam of Viet-Nam, Nam pla of Thailand, and Patis of the Philippines). The different qualities of products depend on the different raw materials (anchovies, clupeids, mackerels, gizzard shad, etc.), the amount of salt used (1 : 5, up to 1 : 1 part salt/fish), fermentation time (5 to 18 months), and certainly many more or less capricious factors. The residue, after the first liquid has been drawn off, is extracted up to 3 or 4 times with salt water. Often, after 3 or 4 extractions, the residue is taken out of the vat and transferred to a boiler to be finally extracted with boiling brine. This brine is then passed through new residues. These extracts are mixed with different amounts of the first genuine liquid and thus different grades of fish sauces are obtained. The nutritive value of the poorer grades is very doubtful, and though they may be cheap, it is probably a most profitable way of selling salt water.

Though not a standardized product (excepting Nuoc mam), a good quality fish sauce might be estimated from chemical analyses. A first-grade fish sauce should contain 2 to 3 g. nitrogen/100 ml.; of this, a minimum of 50% should be formol titratable and not more than 15 to 20% titratable as ammonia. The salt content should be 20 to 25 g./100 g. and the pH below 6.0.

In Thailand, a first-grade Nam pla (containing 2.4 to 2.9% N), is sold at about 7 baht*/liter, and a second-grade (1.6 to 1.9% N) at about 3½ baht/liter, which would indicate that better grades

*1 baht = 7*d* sterling = 8 U.S. cents.

of fish sauces are rather expensive. It is generally agreed that the breakdown of the fish flesh during the process is caused by proteolytic enzymes from the intestines and the fish flesh, and that bacteria play a less important, if indeed any, part in the process. On the other hand, special bacteria (Clostridia) eventually are responsible for the peculiar and strong flavor and taste of these products, which make them different from fish hydrolysates manufactured in other ways. Owing to the high salt concentration, the enzymatic breakdown of the flesh is a very slow process. Several processes have been worked out for enzymatic hydrolyses of fish flesh without the use of salt as a preservative. The French experiments in this field are well known (5, 11). It is to be expected that such rapid methods will give products different from the real fish sauces of Southeast Asia, and which perhaps will be unacceptable in countries accustomed to the strong flavored sauces. On the other hand, the low salt content should make these products more valuable as a real food resource; the East Asian fish sauces are recognized more as condiments.

La Société "Les autolysats français" has reported (6) the following analysis of its fish autolysates (per 100 g. dry matter):

Protein	81	g./100 g.
(Of this amino acids) . .	40.5	"
NaCl	5	"
Other minerals	14	"
Vitamin B ₁	240	µg./100 g.
Vitamin B ₂	800	"
Vitamin PP	14 500	"
Vitamin B ₁₂	200	"

Experiments carried out by one of the present authors (K.B.) on the manufacture of fish autolysates have been of a preliminary nature, and have consisted mainly in storing at elevated temperatures salted clupeids and mackerel, caught at different stages in the spawning cycle. The best results were obtained with spring mackerel caught just before spawning time. This mackerel is rather lean (6% fat) and is known to have very active enzymes in the entrails. The fish were minced, mixed with salt, and stored under pressure at a temperature of about 20° C. The amount of salt used could be as low as 15% without the occurrence of putrefaction. After 4 months, the pickle was drawn off and analyzed, using the N-partition method of Rosé (10) to judge the quality. The taste and smell of the products manufactured from mackerel were very rich and rather strong, without any fish taste. The products from herrings and sprats, on the other hand, were not much different from ordinary salt herring

brine. These apparently have to be fermented for a much longer time to make a true Nuoc mam. In Table 10, the analysis of a mackerel product is compared with that of Nam pla (a commercial sample from Rayong Province, Thailand, exhibited at the Hull meeting) and commercial, first quality, Nuoc mam and Patis. Data on the commercial samples have been taken from the published literature (8, 12).

TABLE 10 — COMPARISON OF A MACKEREL PRODUCT WITH NAM PLA, NUOC MAM AND PATIS

	Mackerel	Nam pla	Nuoc mam	Patis
	22.2 g./100 gml.	28.9 g./100 gml.	26.9 g./100 gml.	28.2 g./100 gml.
NaCl.....	3.42 "	0.92 "	2.50 "	2.20 "
N (total).....	0.42 "	0.28 "	0.41 "	0.18 "
N (ammonia).....	0.03 "	0.02 "	—	—
N (TMA).....	0.97 "	0.62 "	2.09 "	2.02 "
N (organic).....	2.36 "	0.83 "	1.64 "	1.18 "
N (Formol).....	1.94 "	0.55 "	1.23 "	1.00 "
N (Amino).....				
Amino-N/total. N.....	57 %	60 %	49 %	45 %
Ammon-N/Total N.....	12 "	30 "	16 "	8 "
Formol-N/Total N.....	69 "	90 "	65 "	53 "
pH.....	6.05	5.75	—	—

Judging from these analyses, the sample of Nam pla must have been of low-grade quality and not representative of good quality Nam pla. The high content of organic N in the mackerel sample, of which about 70% is formol titratable, should indicate both a high nutritional value and good stability. Such figures, unfortunately, do not tell anything about the taste and smell, which are the most important factors in the success of the product.

The main purpose of these experiments was to see if the residue, after the liquid had been drawn off, could be used for autolyzing herring meal. If so, herring meal might be a potential source of raw material for the fish sauce industry in Southeast Asia. This industry is based on cheap, surplus fish, which is not regularly available. The experiments did not indicate great possibilities for utilizing herring meal in that way. The proteolytic properties of the residue seemed to be rather low, though a fermented fish paste was formed with a somewhat strong, but not unpleasant, taste and smell. Experiments utilizing fish meal for fish paste manufacture have been reported from Japan (4). The fish meal was softened and swelled and fermented either by means of a mold (*Aspergillus oryzae*) or by pyloric caeca from tuna. In the countries of Southeast Asia, considerable amounts of fish entrails from the salt fish industry are usually wasted and might perhaps be used in the manufacture of fermented products from

imported fish meal. It should be brought to mind that the degree of utilization of the raw material in fish sauce manufacture is rather low. Even after one year's fermentation, a considerable amount of protein remains in solid form, and the salt residue is only utilized as manure. One can hardly see better ways of supplying the undernourished people in these countries with cheap protein than in the form of herring meal.

Fish Meal for Human Consumption

As previously mentioned, ordinary fish meal was thought to be acceptable in most of the areas where inquiries have been made. No doubt considerable amounts of fish meal could be used as food, if introduced properly. This does not necessarily mean that any fish meal intended for fodder is fit for human consumption, nor that it would be accepted among the people in underdeveloped countries. Usually these people are extremely conscious of fish spoilage if they intend to consume the product themselves. Even though they will often prefer a strongly flavored meal, they will not tolerate off-flavor of a type that is unfamiliar to them. Some precautions, therefore, must be taken as to freshness of the raw material, and proper manufacturing and storage conditions. If not properly processed as, for instance, if the meal has been exposed to prolonged heating at high temperature, severe damage to amino acids and vitamins might occur. Bender and Miller (1,7), have examined fish meals from different parts of the world, and have found values for the net protein utilization (N.P.U.) to range from 20 to 74, and digestibility to range from 50 to 90%. The damage seemed to be of the Maillard type and methionine was the amino acid chiefly involved.

The production of a neutral fish meal which can be incorporated into food, e.g., by admixture with wheat flour, has for years been the subject of extensive experiments in laboratories in many countries. The main difficulties may be summarized as follows:

- (a) to remove the last traces of fishy taste and odor, and to obtain a product in which these properties do not reappear after some time in storage;
- (b) to find methods where the processing does not result in reduced biological value of the protein;
- (c) to carry out industrial production on an economical basis.

Despite the fact that several patents describe methods for the production of a neutral fish meal, industrial production is still in the experimental stage. The methods so far tried all involve some kind of solvent extraction and some special treatment to remove or mask the last traces of odor and flavor. As

mentioned above, one of the difficulties has been to prevent the reversion of flavor during storage. Generally speaking, it is easier to remove undesired taste and smell from fresh fish than from dried meal.

III. FAO's Work with Edible Fish Meals

FAO's Nutrition Division, in collaboration with the Fisheries Division, and the United Nations Children's Fund (UNICEF) have, for several years, been actively engaged in the evaluation of the possibilities of incorporating suitable fisheries products in the food of protein-deficient people.

The Nutrition Division has considered it as one of their most important tasks to find edible meals which will provide cheap proteins of high nutritive value to supplement the proteins of the cereals which form the bulk of the diet of the poorer classes in many parts of the world. The lack of sufficient protein of high nutritional value in the diet of mothers and children is a most serious nutritional problem, especially in tropical regions. Fish meal is of special interest in this connection because of its high content of valuable proteins, minerals and B vitamins, its low price, its ease of distribution and storage, and the fact that in most cases the incorporation of fish meal in local traditional dishes and food preparations is rather easy. UNICEF, who wish to encourage countries working to produce their own local protein-rich food, have shown great interest in the possibilities of using fish flour as an alternative to milk protein, and can contribute by helping governments to set up suitable plants if local, cheap, surplus fish are available.

Before a fish meal can be introduced into a specific area, it is necessary to carry out acceptability tests, to find out whether the meal can be added to local dishes and consumed regularly over prolonged periods without becoming objectionable.

As of May 1957, about 30 preliminary and 19 large-scale acceptability tests, comprising both "flavorless" and non-deodorized fish meals have been carried out or started on the initiative of FAO in 14 different countries.

In the large-scale tests, usually involving 50 to 200 children, the "enriched" food preparations, containing the fish meals, have been given daily over 1 to 2 months. The amount of fish flour to be consumed daily by a child receiving fish flour as a protein-rich supplement has been from 10 to 15 g. (7 to 12 g. protein), corresponding to the 30 to 40 g. of skim milk powder provided in most UNICEF-supported child feeding programs. To ensure that unfamiliar protein-rich foods, such as edible fish meals, are suitable for infants and children, the World Health Organization (WHO) has set up advisory groups to advise FAO and UNICEF in these matters. The problem of producing and utilizing edible

fish meals, especially deodorized meals, is still only in its early stage. Detailed research is needed on the processes of flavor removal and "flavor reversion," and the influence on the nutritive value of the final product, of heating and other procedures used in manufacture.

IV. Packaging of Fisheries Products for Tropical Consumption

One of the main problems in marketing cured fish products in tropical areas will be to find a sufficiently cheap and efficient packing material. Both temperature, humidity and insect attacks, have to be taken into account. Dried fish products may possibly be protected against the detrimental effect of humidity and oxidation by storing in polythene containers, but polythene wrappings do not usually prevent the penetration of insects. The use of insecticides in this connection seems to be called for, but there still remain many basic problems to be solved, both regarding the practical application of the insecticides to warrant a satisfactory long-lasting effect, and the possible toxic effect of the products. Preliminary experiments, recently carried out in Japan (9), showed that it was possible to protect dried fish products from insect attack for more than a whole year, by applying π -Benzenehexachloride to the inner wall of the wooden containers (vinyl acetate was used as adhesive), or by placing pieces of paper, bearing the same chemical, together with the product in the carton.

V. Summary and Conclusions

The conclusion drawn from this survey, was that the Group in the first instance should concern itself with the problems of the manufacture of unsalted, dried, or smoked and dried, whole herring products, similar to the dried bonga which seems to be popular especially in the Guineas and Congo. The information gathered by the Group on the types of fish products at present eaten in tropical areas, and the methods of processing there, have provided evidence that many such products might be manufactured from European surplus herrings. Most promising, both from a technological and a marketing point of view was a dried, or dried smoked product, made from whole, unsalted herring. This would be likely to find a ready market in many African countries, provided it can be sold at about 1s. per lb. The processing of such a dried, smoked product in North European countries, and the production costs involved, are still not satisfactorily clarified and need further investigation. When new products are considered, not having exactly the same taste and flavor as the fish products to which the local population is accustomed, it is highly desirable that appropriate acceptability tests be carried out.

The manufacture of fermented products, such as the typical Southeast Asian products, is well reviewed in the literature, but

repeated trials with different raw materials and varying manufacturing conditions should be carried out before a procedure giving a "standard product," similar to products in other countries, can be recommended. Although the classical fish sauces, with a high salt content in proportion to protein content, are more to be regarded as condiments than as valuable sources of protein, possibilities exist of manufacturing fish sauces with a higher proportion of protein. Such products, likely to be less flavored than the East Asian fish sauces, might be introduced in other countries outside the South China/Java areas. Though there might be some doubt as to whether fermented products manufactured in Europe could find a market, the Group decided to carry on experiments with the manufacture of fish autolysates from clupeids, and especially to explore the possibility of using herring meal as a raw material for fish sauce manufacture.

Dried fish, in the form of fish meals, seems to be the most acceptable commodity in most of the countries where enquiries have been made. With few exceptions, fish meal or dried minced fish ranked highest on the list of suitable products. In these countries, dried fish is usually cut up into small pieces or powdered before being incorporated into cereal dishes. Fish in the form of flour would not be difficult to use in the traditional dishes. The preference is for a strongly flavored product; hence, a deodorized fish meal is not required and, in most instances, not desired at all. Non-deodorized fish meal would be preferred in most countries, if manufactured by low temperature reduction processes, and if precautions are taken to meet appropriate sanitary standards. The production of neutral or flavorless fish flour is still only in the early stage, in spite of the fact that some promising processes have been worked out. There are considerable gaps in knowledge acquired so far, and the co-operation of research institutes is needed in carrying out basic investigations on these and other problems.

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TRAINING CENTERS ORGANIZED BY FAO FISHERIES DIVISION IN PERU AND AUSTRALIA

Two training centers are being organized by the FAO Fisheries Division for the latter half of 1957. one to take place in Peru, the other in Australia.

The Latin American Fish Processing Training Center, to be attended by participants from the countries in Latin America, will be held in Lima from 21 October to 14 December. The Center will deal with the technology of fish handling, processing and preservation (salting, drying, canning, freezing), by-products, quality control, and sanitation. Dr. W.F. Hampton, Chief, Fish Processing Section, Technology Branch, FAO Fisheries Division, will be Associate Director. Dr. Cristobal Vecorena L., Director of Fisheries and Game, has been appointed by the Government of Peru as Director of the Center. It is expected that about 25 participants will attend. Most of these will be men in government service, who are responsible for fish processing development programs, research and similar activities, but the governments may also nominate technologists from organizations and firms, active in the fishing industries.

Eighteen governments are co-operating with FAO in organizing the Indo-Pacific Fisheries Training Center in Fishery Co-operatives and Administration, which opens on 16 December 1957 and will last for six weeks. The first month of the course will be held at St. John's College, Sydney University, after which the students will go to Adelaide for field work there and at various South Australian fishing ports.

About 25 participants from the Indo-Pacific countries are expected, apart from those nominated by the Australian Government. The course has been prepared primarily for co-operative leaders and government officials who are responsible for running fishery co-operatives in their own countries. It will provide practical instruction and demonstrations, specifically directed toward dealing with the particular problems of organizations and methods in fishery co-operatives.

FISHERIES DEVELOPMENT IN FAR EAST COMMONWEALTH COUNTRIES

A statement on recent fisheries development in Commonwealth territories in the Far East was presented to the 7th Session of the Indo-Pacific Fisheries Council, Bandung, in May 1957, by the British delegate, Dr. Tham Ah Kow, Chief Fisheries Officer of the Singapore Fisheries Department.

In Malaya, the traditional inshore fisheries have, with government assistance, expanded seawards, and fishermen now operate up to 500 miles (800 km.) away from their home port, as compared with a maximum of 35 miles (56 km.) a few years ago. Existing fishing gear has been modified for use with motor driven craft and, for the first time, the purse seine net has been used for catching Malayan anchovy, *ikan bilis*.

Although outboard motors are still widely used, there were 996 inboard-engined craft in operation at the end of 1956 as compared with 603 a year earlier. Mechanical ice crushers, hoists and derricks, multi-purpose canneries and refrigeration plants, have helped the development of the industry.

A Fish Culture Research Station, to cost about M.\$ 2 million, will shortly be completed in Malacca. It will have a senior staff of six scientists and a fully equipped laboratory. The scientists, with more than 150 ponds at their disposal, will carry out investigations on fresh-water fish culture, with a view to improving fish farming methods in the area.

Much progress has been made in the Singapore fishing industry, and large mechanized vessels of up to 100 tons are now fishing in the South China Sea. Pair-trawlers are being used, and it is hoped that a pair-trawl industry will soon be firmly established. As a further step to encouraging development of the industry, a "training-within-industry" apprenticeship scheme has been proposed and has aroused the interest of fishermen. A mobile unit for instructing fishermen in the maintenance and repair of engines installed in local fishing boats has been very successful. Another development encouraged by the Government is the conversion of swamp lands into ponds for shrimp production.

A government-sponsored loan scheme has been launched in Sarawak to enable fishermen to fit inboard engines into their boats. Considerable attention is being paid to development of the fresh-water fisheries of the country.

In Brunei, government loans have resulted in increased mechanization, which has led to a rise in fish production generally and in shrimp production in particular. This increased production has resulted in greater consumption of fresh fish and a drop in the consumption of dried and salted fish.

The total value of the Hong Kong catch for the past year showed an increase of nearly H.K.\$ 6,500,000 over the previous year. More than 40,428 tons of fresh, dried and salted fish were sold through the Hong Kong Fish Marketing Organization. A new

wholesale market has been established in a village near the Chinese mainland and is operating very successfully.

The Hong Kong Fish Marketing Organization lends money to fishermen for productive purposes. This year funds have been advanced to enable local fishermen to build two mechanized 80-ft. wooden trawlers, while loans have been made for the purchase of Diesel engines and gear, and funds have been provided for general research, particularly in oyster production. More than 1,700 fishermen's children have been educated in schools operated or financed by the Organization.

COST AND PROFIT IN SWEDISH FISHING VESSELS *

Introduction

The most important sea fisheries of Sweden are those on the west coast. Since 1951, continuous "cost and profit" investigations have been carried out by the Swedish West Coast Fishermen's Union, which comprises nearly all the 6,000 fishermen active along the coast. These men form part of fishing crews, who, in turn, own boats and gear equipment. There have been no fisheries operated by nonactive owners since the once important steam trawl fishery ceased a few years ago.

Before the war, very little was known about cost and profit in Swedish fisheries. Figures were based on casual statements and estimates of various kinds. In 1945, the Union set up a committee to investigate production costs in the west coast fisheries. The writer of this article was commissioned to undertake the investigations which, after some preparatory work, were started in 1950. The most important material was obtained from the special bookkeeping records, in two cash books, which the crews maintained at the request of the Union. During the chief period to be dealt with here — 1951 to 1953 — about 900 active fishermen, representing 15% of the total, participated in the scheme.

The first cash book gives the total income of the fishing crew, the running expenses paid jointly by them, and the distribution of the boat and gear shares to them. These shares, which leave the book as expenses, are carried into the other cash book as income, while the total cost for boat and gear are shown as expenses. Since these investigations started, at least 90% of the participants have kept the books correctly.

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Important material for the investigations was also obtained from questionnaires distributed to various groups of selected fishermen, and from revision of income tax declarations. Such an investigation, carried out in 1953, covered about one sixth of the West Coast fishermen.

Every sixth name in a comprehensive register of active fishermen under 67 years of age was selected at random. Of the 851 fishermen thus chosen, 98% completed the special questionnaire sent them. The writer was also able, with special permission, to examine the income declarations of 1954 (relating to 1953) from the same fishermen.

It should, however, be pointed out that the basic investigations are not wholly representative, as they cover only some 15% of the Swedish west coast fishermen. In any investigation based on voluntary participation, it is always the most active and successful individuals who respond. This tendency is strengthened by the fact that those fishing crews who have encountered great difficulties, or have been forced to lie idle over a long period, are not interested in such investigations. Participators in the investigation were those fishermen making a 10 to 20% higher profit than the average for the whole of the west coast fishery. The larger fishing vessels require and take interest in bookkeeping, while the smaller vessels neither need nor want it to the same extent.

The examination of the investigation material, partly by use various coastal of the Hollerith system, was done in such a way as to show the profit within the various coastal districts, and for vessels of various size. The present paper has been limited to the question of cost and profit for fishing vessels of various sizes.

1. Size Grouping

Firstly, there was the problem of size grouping. This could be done by tonnage, length, insurance value or horsepower. For various reasons division by length and gross tonnage was deemed inadequate.

At the start of investigations, the vessels were classified by engine power, this seeming a comparatively good measure of the productive capacity of a boat. Very soon, however, various difficulties were apparent. It was almost impossible to obtain precise information on the engine power. The principles for indicating engine power were revised some years ago, and this led to changes in rating. Thus, certain types of engines, originally classified as 180 h.p., were later put in the 210 h.p. class. In some instances the increase in h.p. took place several times, which meant that engines of apparently the same power could be graded in various classes.

Another and considerably greater difficulty was that engines are regularly changed in fishing vessels, the new engine usually

being stronger than the old one. This means that vessels of a quite different type appear in the same category. Obviously, a larger vessel, which was designed and built with a more powerful engine, would have a greater production capacity than a smaller vessel which has merely installed a new, more powerful engine. Classification by engine power, therefore, cannot pay regard to the size of the vessel and reconstruction, nor to improvements such as the installation of new technical devices, etc.

A more satisfying classification of vessels can be obtained by taking the insurance value as a basis. The fishing vessels on the Swedish west coast are practically all insured by their own mutual associations, which accept only insurance values set by special inspectors. Change of engine, reconstructions, etc., increase insurance values only if there is an increase in real value.

The insurance values, accordingly, have been the basis of the classification of fishing vessels with regard to size. An exception was made for small boats which are not insured and therefore have been put together in a special class. When the 1952 declarations were examined, there was no information on the insurance value of the vessels. In this case the classification was by engine power.

Since engine power was introduced into fishing vessels, development has resulted into an ever-increasing size of boat. It was only in 1925 that the first fishing vessel was fitted with a 100 h.p. engine, but the fishing fleet on the west coast now has more than 500 vessels with motor power surpassing 100 h.p., new vessels having engines up to 500 h.p. A Swedish west coast fisherman working on a modern vessel is of a greater production value than many a comparable worker in industry.

Development among smaller boats is slow. They belong to the past, when conditions were different. For example, investigations in 1951 showed that only one vessel in the 50 to 100 h.p. class had been built after 1939, while half the fleet was more than 30 years of age. On the other hand, only one vessel of more than 200 h.p. was built before 1938, the majority being built in 1947 or later.

A division of the fishing vessels by size is to a certain extent also a division into various types of fishery. The most profitable size of vessel differs according to the type of fishing. Investigations have shown that for every fishery the profit rises to a certain point, then sinks. The type of fishery determines the size and class of fishing boat used. For instance, the Swedish herring fishery in the North Sea is completely dominated by vessels of more than 150 h.p., whereas the mackerel drift net fishery can be carried on with almost any size of vessel. Profits, of course, vary considerably according to the type of vessel.

Trawl fishing has a dominating position in the Swedish west coast fishery. The smaller vessels are engaged in shrimp trawling, the slightly larger vessels in bottom trawling for herrings and fish, and the larger vessels in mid-water trawling. The largest

vessels are active in the herring fishery on the Fladen Ground in the North Sea, using bottom trawls.

The smaller and smallest vessels work the drift and ring net and the hook fishery as well as inshore fishery, including lobster catching.

II. Various Examples

Table 1 gives particulars about values of catches, cost and profit taken from investigations for the three years 1951-1953. It shows that the variations in catch values between vessels of

TABLE 1 — CATCH VALUES, COST AND INCOME 1951-53 FOR FISHING VESSELS OF VARIOUS SIZES

Insurance Value of Vessel (1,000s SKr.)	Catch Value (SKr.)	Costs			Interest and Amortization		Income Fisherman (SKr.)
		Running (SKr.)	Gear (SKr.)	Mainten- ance (SKr.)	SKr.	%	
Uninsured.	7 772	660	486	343	674	—	—
1 - 10.	15 458	1 903	1 684	1 272	1 506	25.5	3 065
11 - 20.	32 181	6 399	3 219	2 667	3 896	25.5	3 259
21 - 40.	50 316	9 686	4 261	4 424	5 806	19.1	4 520
41 - 60.	68 671	18 358	6 075	5 946	7 900	15.2	5 573
61 - 80.	96 308	28 661	7 822	8 190	10 792	15.0	6 078
81 - 100.	119 847	37 802	10 037	10 656	11 930	12.8	7 453
101 - 140.	150 813	49 713	12 245	12 112	16 152	12.8	9 468
141 - 180.	170 717	52 904	13 645	11 899	22 367	13.8	10 973
181 and over.	179 021	53 536	12 840	12 060	26 517	12.8	11 188

various sizes are very important. The smallest, uninsured vessels make an annual catch valued at less than SKr. 8,000,* while that of the largest vessels is about SKr. 180,000.

This increasing catch value is related to the running costs and labor. The percentage distribution between the three cost items is illustrated in *Figure 1*.

Under "running costs" are included the expenses paid by the fishing crews as a whole, before sharing takes place. As Table 1 shows, these running costs range from SKr. 660 per annum for a fishing vessel of the smallest class, to SKr. 53,500 for one in the largest class. As the size of the vessel increases, so do the running costs in relation to the value of the catch, up to a point. The increase is from 8.5% for the smallest uninsured vessel to 27% for the vessel of SKr. 40,000 to 60,000 insurance value. After this, however, it generally remains unchanged at about 30% and even decreases a little for the largest vessels.

* \$1 = SKr. 5.17

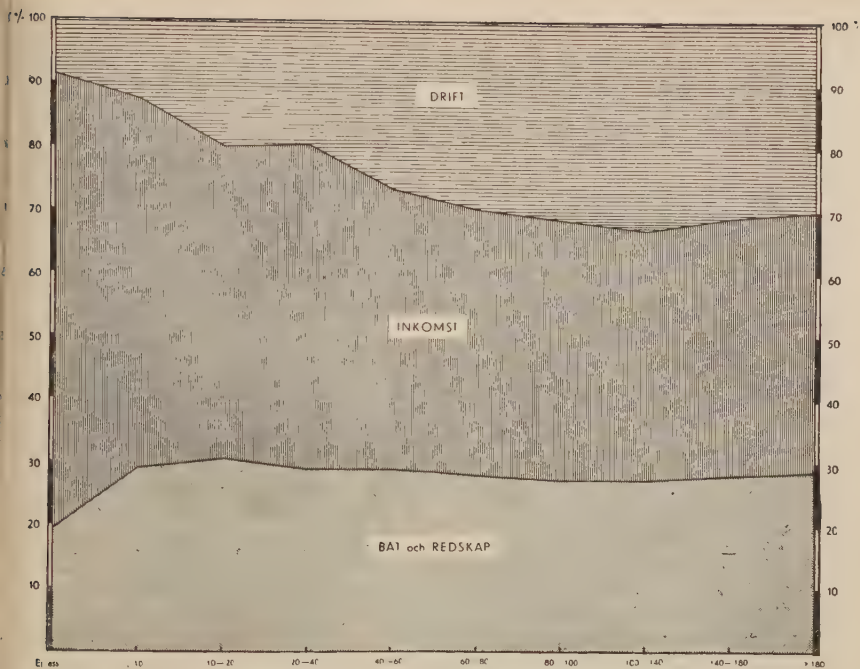


Figure 1. Catch values and cost for fishing vessels of various sizes 1951-1953 (insurance value SKr. 1,000)

Drift - running costs. Inkomst - income. Båt och redskap - vessel and gear

(a) Fuel

Fuel makes up a large part of the running costs, rising from SKr. 500 for the smallest vessels to SKr. 25,000 for the largest. This represents from 6.5% to 14% of the catch value up to the SKr. 10,000 to 20,000 class. After this, however, the percentage remains practically unchanged. If the two smallest classes of vessels are omitted, it can be said that fuel costs of all classes of vessels represent from 13 to 15% of the catch value.

(b) Packing (Boxes and Barrels)

In the smallest vessel the cost of packing is negligible, but increases rapidly with size to 10% of the catch value for the SKr. 60,000 to 80,000 class. This percentage sinks a little for the very largest vessels.

(c) Ice and Salt

The cost is insignificant for the smallest vessels, which usually fish close to land and do not have to ice their catches. Ice and salt cost the medium-sized and large vessels 2 to 3% of the catch value.

(d) *Other Expenditures (Provisions, Harbor Dues, etc.)*

These represent about 1% of the catch value for the smaller and medium-sized vessels and 2.5 to 3.5% for the larger vessels.

As is to be expected, Table 1 shows that the cost for vessel and gear varies with the size of a vessel, but not to the same extent as do the running costs. For the smallest vessels the cost is about SKr. 1,500 per annum, but for the next class it rises to SKr. 4,500, representing 30% of the catch value. Cost figures for vessel and gear for 9 of the 10 classes of vessels lie between 27 and 30% (see *Figure 1*). The annual cost is more than SKr. 50,000 for the largest vessels.

As regards gear, Table 1 shows that the annual cost is about SKr. 500 for the smallest vessels but SKr. 13,000 to 14,000 for the largest vessels. Apart from the smallest vessels, as the size of the vessel increases a decreasing part of the catch value is put aside for gear costs, ranging from 11 (smallest) to 7% (largest vessels). In the case of the smaller vessels certain gear costs are paid out of the crews' shares.

The position is almost similar regarding maintenance. This increases from about SKr. 350 for the smallest vessels to about SKr. 12,000 for the three classes of large vessels. It will be seen that, apart from the uninsured vessels, maintenance of all smaller and medium-sized vessels represents 8 to 9% of the catch value, and only 6 to 7% for the largest, newly built, vessels.

III. Interest on Capital

The amount devoted to interest and amortization of the capital invested varies, as can be seen from Table 1, from almost SKr. 700 for the smallest vessels to SKr. 26,500 for the largest. For the medium- and large-sized vessels (SKr. 20,000 to 100,000) it is 11% of the catch value, rising to nearly 15% for the largest vessels. A closer investigation is required to decide whether this means a good or a poor payment of interest and amortization on the capital invested. The bookkeeping does not give any guidance because, to take an extreme case, a vessel completely free from debt shows neither cost of interest nor amortization.

The methods of the Swedish tax authorities calculating depreciation on the original purchase value are different from those favored by the commercial world. This purchase value of capital goods is only of historical interest from a commercial point of view. An industry needs to set aside capital to purchase new equipment, plant and material and this can be done only if depreciation is calculated on repurchase value. If the time for depreciation of the engine is set at ten years, then in one year ten fishing crews with the same engine must together allow depreciation that equals the price of a new engine as at that time.

A more difficult problem is to determine an appropriate per-

centage of depreciation. A vessel depreciates not only by use but also by obsolescence, and it is reasonable to calculate for depreciation over a comparatively short period. The tax regulations in Sweden often do not allow full depreciation before a new vessel or engine has to be obtained. The fishermen get into difficulties because they have to depreciate the old and the new engine or vessel at the same time. The depreciation allowed by the tax authorities is based on the original purchase price and amounts to 5% on the hull, 10% on the engine, and 20% on the equipment (echo sounders, etc.).

Only the interest paid on borrowed capital is recorded, but to this should be added that on the crew's own investment, and to do this, the amount invested must be known. From a commercial point of view the estimate is correct if it equals the difference between the present value of the vessel and the debt outstanding on it. The present value is calculated as the replacement value, less depreciation, and the interest is, therefore, calculated with reference to the present value of the vessel and not its original cost. The greater the security, the smaller the interest. As the investment of the fishing crew bears the greatest risk, it must be allowed the highest rate of interest.

In this investigation access to the replacement value of the vessels was not allowed only to the insurance value. In the case of the large, modern vessels both the replacement and the present value nearly correspond to the insurance value. In the case of older vessels the replacement value is considerably higher than the insurance value, while the present value is, as a rule, considerably less. Rebuilding of the vessel and installation of new engines are very important in calculating the present value of these vessels.

Only the known insurance values are shown in Table 1. By using 5 to 20% depreciation for various parts of the vessel, as allowed by tax authorities, an average depreciation of about 7.5% is obtained, to which it would be reasonable to add about 4.5% for interest. These two figures add up to a total cost of amortization and payment of interest of 12% on the insurance value. As Table 1 shows, this is close to the 12.8% and 13.8% yielded by the vessel and gear shares for the largest vessels and the largest class of medium-sized vessels (SKr. 80,000 to 100,000).

On this basis, the large vessels and the largest among the medium-sized vessels obtained, during 1951-53, vessel and gear shares sufficient to cover the cost of gear and maintenance also for reasonable depreciation and interest on a capital corresponding to the insurance value of the vessels. The shares for the smaller vessels also provided, over and above that, some profit to their owners.

If one remembers that the larger vessels are of recent construction with low costs of maintenance, it is evident that the percentage of interest earned on the capital invested decreases with the size of the vessel.

If the total cost of interest and amortization is taken as 12 % of the insurance value of the vessel, on an average every share owner gets a profit of SKr. 400 to 900 per annum, dependent on the size of the vessel. If interest is taken as 13 %, the share owners of large fishing vessels lose and only the smaller vessels show a profit to their owners.

IV. Profit

Finally, there is the question of the fisherman's income. This income is obtained in the form of "man shares" paid to the adult members of the fishing crew.

The "man shares" make up not less than 72 % of the catch value on the smallest, uninsured vessels. This is reduced to about 59 % for the next size of vessel, and for the next group, vessels up to SKr. 20,000, the catch value is divided about equally between the man shares and costs of various kinds. In the case of medium-sized and large vessels, the shares represent 40 to 44 % of the catch value (see *Figure 1*).

The income derived from these "man shares" by a fisherman is shown in the last column of Table 1, and by *Figure 2*, where catch value and cost *per fisherman* on vessels of various sizes are also indicated.

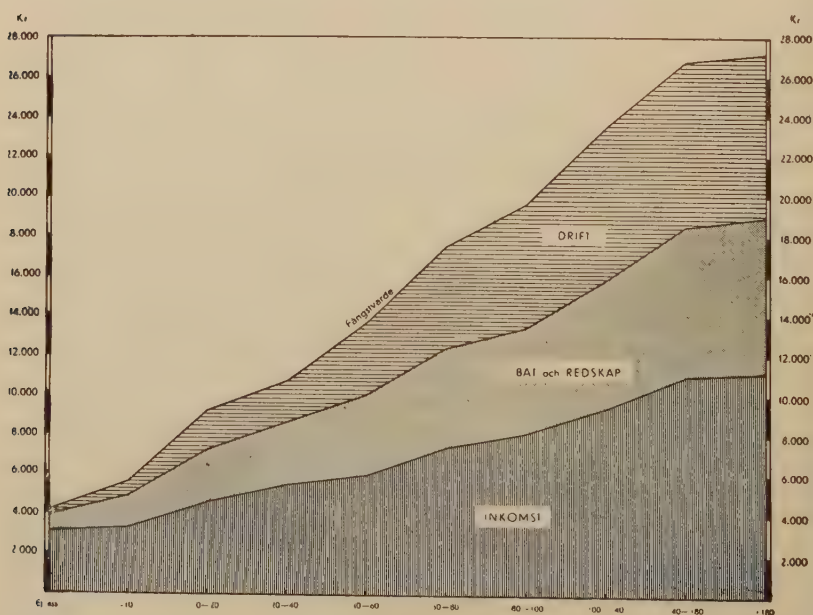


Figure 2. Catch value, cost and income to fishermen on vessels of various sizes 1951-1953 (insurance value SKr. 1,000)

Table 1 shows that even if running and other costs in bigger vessels are higher, the greater efficiency of the fisherman on such vessels results in higher earnings. For example, during the three-year period 1951-53, the average income of a fisherman in the smallest class of vessel was little more than SKr. 3,000 compared with as much as SKr. 11,000 per annum for fishermen working in the two largest classes of vessels.

Figure 2 shows the catch value per fisherman in vessels of various sizes, ranging from SKr. 5,000 to nearly 30,000.

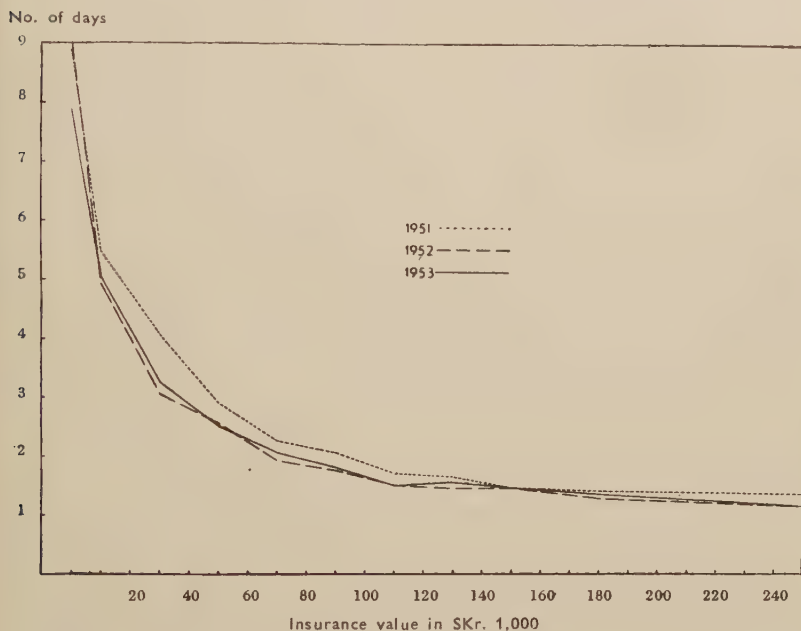


Figure 3. Number of working days required on vessels of various sizes to produce fish to the value of SKr. 100

This development is further illustrated in Figure 3. The curves show the working days required to produce fish to the value of SKr. 100. The three curves apply to the investigations, 1951 to 1953, and show that 8 to 9 working days were required on the smallest uninsured vessels, but very much less in the larger vessels. In vessels with insurance values up to SKr. 20,000, the working time was about five days. In vessels with insurance values of SKr. 20,000 to 40,000, less than 3.5 working days were required for the production of fish worth SKr. 100. After this, the curves sink more slowly. This indicates that larger vessels certainly save labor, but not at the same rate. Among the larger of the medium-sized vessels, almost two working days are required for the production of SKr. 100 of fish, while in the smallest class of large vessels 1.5 days are required. For the largest vessels the figure is 1.2 days.

While larger vessels make more profit, they usually earn less interest on the capital invested. This is especially true of the largest vessels. When the normal cost of repairs is taken into consideration, the shares for vessel and gear are very low, but this is partly compensated by the fact that the vessel owners are members of the fishing crew and get the benefit of a greater man share than is obtained on smaller vessels.

Table 2 gives the results of the questionnaire sent to fishermen in 1953, concerning income and profits. On account of scarcity

TABLE 2 — INCOME AND PROPERTY 1953 OF FISHERMEN ON VESSELS OF VARIOUS SIZES

Share in Vessel (h.p.)	Income from Fishing		Property		Percentage West Coast Fishermen (%)
	Share in Vessel (SKr.)	Other (SKr.)	Vessel (SKr.)	Other (SKr.)	
0 - 10	230	3 600	1 400	6 900	9.6
11 - 50	470	5 030	2 100	6 800	9.6
51 - 100	980	6 370	3 700	13 300	22.2
101 - 150	960	7 640	5 400	11 100	31.9
151 - 200	930	9 260	8 300	11 300	12.4
201 and over	1 020	10 550	9 300	8 600	13.9

of information about insurance values, the vessels have been classified by engine power. Those previously referred to as "smaller vessels" are included in the 50 h.p. group; the medium-sized vessels are in the 51 to 150 h.p. group, and the large vessels in the class of over 150 h.p.

As seen in Table 2, profit from the vessel share as estimated by tax authorities increases from SKr. 230 for the smallest to more than SKr. 1,000 for the largest vessels. The average income of a fisherman from vessel shares amounted to SKr. 850, based on declared income of 1953. The fishing income, apart from the vessel shares, increased from SKr. 3,600 for the smallest vessel up to SKr. 10,500 for the largest.

As the last column shows, less than 20% of the fishermen on the west coast are employed on vessels of under 50 h.p., 55% on vessels of 51 to 150 h.p., and 25% on vessels of at least 150 h.p.

It should perhaps be remembered that more hard work is required from the fishermen on medium and big vessels than from those on smaller boats. The investigation showed that the age groups of fishermen in relation to the vessels were as follows: those of 15 to 34 years of age were employed on vessels with an average engine power of 148 h.p.; 35 to 49 on vessels averaging 115 h.p.; and 50 to 67 years of age on vessels averaging 93 h.p. About 47% of the young fishermen are part owners of the vessel, 68% in the second age group, and 66% in the third.

V. *Trend Toward Larger Fishing Villages*

The trend toward building larger fishing boats has its effect on fishing villages. On the Swedish west coast only those fishing villages are growing where there are at least 100 active fishermen. Large fishing villages have increased their share of the fishing population from 48 % in 1920 to 65 % in recent years.

The investigation showed that in villages with 1 to 24 active fishermen, the boats were equipped with engines which rated 46 h.p. on the average. In villages with 25 to 49 active fishermen the average rating was 92 h.p. engines, while villages with at least 100 active fishermen used boats with an average h.p. as high as 144. The average income per annum for a fisherman was SKr. 5,000 in the smallest villages compared with SKr. 9,000 in the largest.

Technical development has lessened the dependence of fishing on shore bases in the immediate vicinity of fishing grounds ; instead fishing has become more tied to bases with good port facilities, maintenance service and supplies for large fishing vessels. Proximity to markets and distribution centers and the existence of good transport facilities to the markets, have grown in importance as utilization has shifted from curing to consumption in the fresh or frozen state. This change in factors determining location is influencing the development in various areas.

Although man shares increase with the size of vessel, this does not mean that the Swedish west coast fishery should develop only larger vessels. Different types of fishing require vessels of varying sizes. Inshore fisheries, for example, are efficiently worked by small vessels which would be useless in middle and deep sea fisheries. In near shore waters not only can small boats be efficiently used, but elderly or even partly disabled fishermen can be effectively employed.

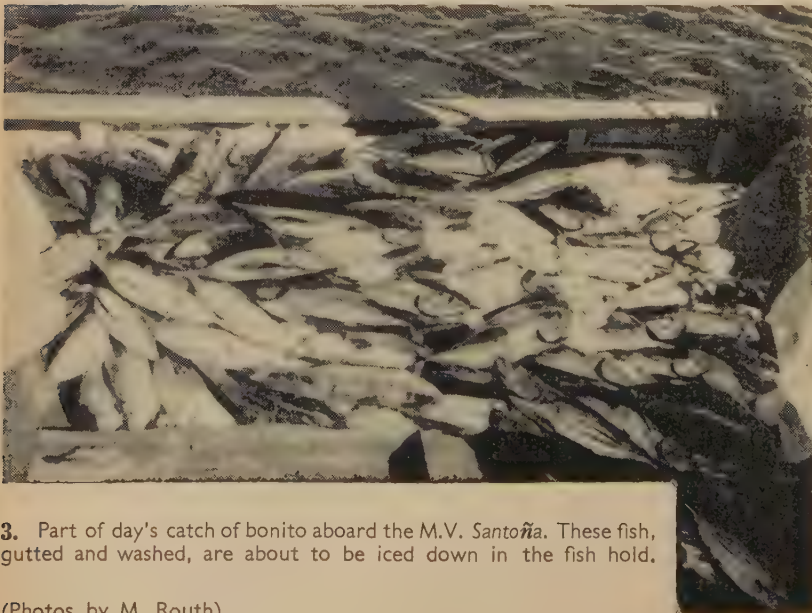
But even with these reservations, there is an economic justification for further development of larger vessels. These are the only fishing vessels in which labor can earn wages comparable with those earned in industry. It is essential for the future of the fishing industry that fishermen should earn such comparable wages. This is very apparent in those fishing districts and large villages which operate with large vessels. In these places the numbers of active fishermen are increasing and the younger generations go into the fishing industry, but where income is low the number of fishermen is decreasing and the young men are going into factories, offices and other employment.



1. Transferring bait fish from the bag of the net to the floating bait cage. The bait fish are handled very carefully, being made to swim from the net to the cage, the opposite end of which is raised. The net is held at the corners of the cage.



The discovery of schools of tuna in the sea around Haiti by Mr. Martin Routh, FAO Fisheries expert, has opened up possibilities for the development of a tuna fishing industry. Following an eighteen-month survey, during which he investigated the fishing possibilities and demonstrated the presence of tuna in



3. Part of day's catch of bonito aboard the M.V. *Santoña*. These fish, gutted and washed, are about to be iced down in the fish hold.

(Photos by M. Routh)





2. Shoal of bonito lured to the stern by the chummer is fished with pole and line from the fishing platforms. The fishermen may wear a safety rope around one leg. Jets of water, played on the surface of the sea, are clearly visible.



Commercial quantities by use of a chartered Cuban boat and crew, and having carried out fish drying experiments, Mr. Routh has returned to Haiti to advise and assist the Government in developing a tuna fishing industry, and to help the small boat fishermen mechanize their boats, use improved gear and catch more fish.



4. Bonito being put out to dry in the morning. To stop them taking up moisture from the damp night air, fish are put under cover each night and spread again each morning. The extent to which they should be dried depends upon the time that will elapse between leaving the drying station and being consumed.

The three layers of drying shelves made of woven bamboo, which run down both sides of the drying shed, can be seen in the background.

Fisheries Division Activities

Dr. D.B. Finn, Director of the FAO Fisheries Division, represented FAO at the 9th Annual Meeting of the International Whaling Commission, London, 24 June. He presented a synopsis of data on the whale resources, prepared by the Biology Branch of the Division.

Regional Office for Europe and the Near East

Mr. M. Girard, Regional Fisheries Officer for Europe and the Near East, in his capacity as Secretary of the General Fisheries Council for the Mediterranean (GFCM), attended the Joint Committee Meeting of the GFCM and the International Commission for the Scientific Exploration of the Mediterranean Sea (ICSEM), Monte Carlo, 6 April 1957. Co-operation between the two bodies was discussed, and it was agreed that any question pertaining to biology of migratory species would be studied in common. The Joint Committee, in future, will meet at least once a year to review the activities of both bodies.

On 26 April, Mr. Girard represented the GFCM at Genoa, Italy, at the first meeting of the International Research Center on the Meteorology of the Mediterranean. This Center which is non-governmental, is still in its preliminary stages. The meeting discussed mainly the statutes of the Center, which have yet to be established, and the program of work. Representatives of the GFCM will be invited to attend future meetings as observers.

Indo-Pacific Fisheries Council - 7th Session

The Indo-Pacific Fisheries Council held its 7th Session in Bandung, Indonesia, from 13 to 27 May 1957. Representatives attended from Australia, Cambodia, Ceylon, France, India, Indonesia, Japan, Korea, the Philippines, Thailand, the United Kingdom, the U.S.A., and Viet-Nam, and observers were present on behalf of the Government of Portugal, the Natural History Society of Indonesia, the Science Council of Indonesia, and the World Meteorological Organization (WMO).

The Council early divided into two technical committees and into the respective panels and sub committees, and arrangements were made for the many working and technical papers to be reviewed as a basis for discussions on the further work to be undertaken by the Council.

In Technical Committee I (Marine and Inland Resources) there was careful review and extensive discussion of a number of

methodological problems, including age determination of tropical fishes, the role of taxonomy in fishery biological research, and a standardization of plankton nets. With regard to the latter, the Council adopted recommendations for practical measures to be taken that will lead to such a standardization. Among the general subjects in marine fisheries discussed were trawling and basic production. Considerable attention was paid to the problems of Rastrelliger (India mackerel) fisheries, and a detailed program was outlined for work to be undertaken in national programs, for collaboration between these programs, and for assistance to be given them by FAO.

The topics with regard to inland fisheries included fish culture and the nutrition of fish under cultivation and the control of weeds, pollution and the introduction of exotic species. Mugil, Chanos and Hilsa were discussed, and proposals were made with regard to the latter for effective collaboration between national research programs.

Technical Committee II (Gear, Craft, Secondary Industries, Socio-economics) discussed economic and institutional aspects of current fisheries programs in the region, as well as certain technological problems in the improvement of fishing and fish processing methods. In recognition of the increased attention devoted to fish marketing problems, and following a recommendation of the 6th Session of the Council, it was agreed to form a special sub-committee on fish marketing. Following a review of a number of reports concerned with economic aspects of fish processing and transport, regional trade, retailing and income levels, the Committee considered its program in relation to certain FAO activities in the region, notably in the field of co-operatives, credit, fish marketing investigations and statistics. The Committee expressed support for these activities and urged still greater attention to training at national level and to the introduction of simple sampling systems for the collection of statistics. It was felt that closer co-ordination of the Council's and FAO's programs could be achieved and, to this end, the Committee's program as defined at the 6th Session of the Council was adjusted to give main priority to the following activities during the next inter-sessional period:

- (a) investigation and evaluation of the fish marketing situation in the region;
- (b) review of government measures concerned with the improvement of fish marketing;
- (c) collection of information on fishery co-operatives, especially in connection with the forthcoming FAO Indo-Pacific Training Center on Fishery Co-operatives and Administration;
- (d) compilation of a minimum range of commercial fisheries statistics;
- (e) collection of information on the extent and operation of credit facilities available to fishermen.

It was mentioned that certain theoretical studies attempted in the past had proved somewhat premature in view of the prevailing lack of comprehensive information on economic and institutional aspects of the fish industries and the shortage of qualified personnel. The range of activities now proposed should prove more consistent with the capacity of the respective government fishery services. It should promote a useful exchange of information and experience on matters of immediate importance in current fishery development programs, and should facilitate and fortify certain related activities of FAO in the region, especially in the Training Center on Fishery Co-operatives and Administration, the current survey of middlemen and co-operatives, and the publication of certain handbooks dealing with credit, fish marketing and statistics. FAO will assist in the drawing up of a questionnaire and a bibliography on fish marketing.

The Council discussed its budget, its program of publications (especially the publication of handbooks and manuals) and certain problems in connection with the establishment of its committees.

The 8th Session of the Indo-Pacific Fisheries Council will be held during the last quarter of 1958 and thereafter the meetings will be held biennially in the last quarter of the year. Mr. K. Kuroshima (Japan) was elected chairman, and Mr. Tham Ah Kow (U. K., Singapore) vice-chairman for the ensuing period.

Biology Branch

Dr. G.L. Kesteven, Chief, Biology Branch, attended the 7th Session of the Indo-Pacific Fisheries Council in Bandung, Indonesia, which was held during May 1957 (a full report of the Meeting is given on pp. 144-46). On his return journey, he stopped in Lisbon, Portugal, to attend the joint ICNAF/ICES/FAO Workshop on Population Dynamics and the Selectivity of Fishing Gear, 27 May to 3 June. S. Holt, Marine Fisheries Section, was also at the Workshop, together with M. Girard, FAO Regional Officer for Europe and the Near East, and H. Kristjonsson of the Fishing Gear Section, Technology Branch.

Joint ICNAF/ICES/FAO Workshop on Population Dynamics and the Selectivity of Fishing Gear

The Workshop took place in Estoril, near Lisbon, Portugal, from 27 May to 3 June, 1957. It was organized on behalf of the participating organizations by the Standing Committee on Research and Statistics of ICNAF, the Comparative Fishing Committee of ICES, and the Biology Branch of the FAO Fisheries Division.

The meeting was attended by research workers from ICNAF and ICES member countries, a research worker from Turkey, and

members of the ICNAF and FAO secretariats. Approximately 100 papers had been prepared by workers of the participating countries and others. The papers referred to three major topics for which it had been proposed to set up separate workshops: population dynamics, the measurement of effort, and the selectivity of fishing gear. These papers were referred, in groups, to various "reviewers" who were able to identify certain major problems dealt with in the papers.

In preliminary discussions before the meeting it was found that the papers prepared for the first two topics disclosed and converged upon relatively few main problems, and discussions were conducted, with reference to these papers, as for a single workshop. These discussions related to:

- (a) definition of concepts and terms concerning fishing effort and fishing mortality, including the identification and classification of fishing gear, and the standardization of the notation used in population research;
- (b) the assessment of the condition of fisheries in which a single species is taken by a single kind of fishing gear;
- (c) the assessment of the condition of more complex fisheries, i.e., those with more than one species or more than one type of gear; here, there was discussion of the estimation of effort and of catch-per-unit-effort indices, and the assessment of effort;
- (d) data at present available on fishing effort, with special reference to the comparison of catch-per-unit-effort from different kinds of gear;
- (e) the determinants of fishing effort and the cause of variation in fishing effort and fishing mortality;
- (f) variation in population parameters with reference to density dependent and density independent effects;
- (g) comparative studies of the effects of fishing with special reference to the possible genetic effects of selective fishing;
- (h) the treatment of data, including evaluation of the "virtual population" method, and the techniques of, and equipment for, computation;
- (i) training of, and collaboration between, population dynamics research workers, and dissemination of information on this type of research.

In the discussions on selectivity of fishing gear it was found that many individual topics should be discussed; these may, however, be grouped under three main headings.

Firstly, there was general discussion of the nature of selection processes and of the effects of selection. These referred to the behavior of the fish and to various physical and technological factors that might determine selection, as, for example, speed of trawling, types of material of which gears are made. These discussions

were independent of several others relating to the immediate determinants of selections, such as mesh and hook size. Mesh size, of course, received very considerable attention, and led to discussion of mesh dimensions, measurement of mesh and the use of gages.

Secondly, there was particular discussion of selection by different types of gear and, in some cases, by different parts of gear. Selection by the forward part of trawls, and by the cod end, was discussed; there was also reference to escapes from different parts of a trawl, to a size selection by trawls and seines, and to the control of selection by the use of savings gear.

Thirdly, there was discussion of research on selectivity, referring to the planning of experiments, the use of underwater observation equipment, the use of covered cod ends, the accuracy required in the measurement of selectivity, the compilation of selectivity data, the terminology of this work, and the presentation of results.

The report of the meeting, besides indicating the lines along which further work should be pursued for each topic, makes recommendations as to action that might be taken by the participating organizations with respect to certain of these topics. Mention may be made of the establishment of a panel to study the desirability of establishing a journal for population dynamics, and of a panel to undertake the compilation of selectivity data in standard form.

The Workshop was preceded by the 7th Annual Meeting of the International Commission for the Northwest Atlantic Fisheries (ICNAF).

FAO Council

The FAO Council Meeting, Madrid, June 1957, approved a proposal requesting FAO to establish a European Inland Fisheries Advisory Commission. This was in pursuance of the resolution adopted at the FAO International Inland Fisheries Meeting, Helsinki, July 1956, and attended by delegations from 13 countries (see *FAO Fisheries Bulletin*, IX (4), 201-202).

In this connection, Wm. A. Dill, Chief, Inland Fisheries Section, visited various fisheries services in Europe and the United Kingdom during April and May, to obtain information on the activities and organization of public offices and scientific institutions concerned with inland fisheries.

During the tour, Mr. Dill also visited various major inland fisheries and biological laboratories and field stations, to obtain information on their current and future programs of research and fisheries managements.

T. Laevastu, Marine Fisheries Section, represented FAO at the meeting of the 4th Session of the UNESCO International Advisory Committee on Research in the Natural Sciences, Stockholm, Sweden, from 10 to 12 April.

Technology Branch

Dr. Ernest Hess, Chief, Technology Branch, attended the International Symposium on the Microbiology of Fish-Curing and Meat-Curing Brines, Cambridge, England, from 8 to 12 April. On his way to and from the meeting he visited Hamburg, Copenhagen, Gothenburg, Stavanger, Bergen, Aberdeen, Hull, London, Paris and Ymuiden, for discussions on the reorganization of the FAO Liaison Committee on Fishery Products Technology, and on the Fishing Gear Congress which is to be held in Hamburg from 7 to 12 October 1957. Some 125 papers have been promised and over 200 prospective participants have already indicated their attendance.

A tentative syllabus and timetable have been prepared for the Latin American Fish Processing Training Center, to be held in Lima, Peru, from 21 October to 14 December 1957, and various lecture material has been assembled. Dr. W.F. Hampton, Chief, FAO Fish Processing Section, will act as Associate Director.

Drawings for a 120-ft. research vessel for the Fisheries Development Corporation of South Africa are also being reviewed. Work has been completed on the design of a 45-ft. tuna fishing vessel for Haiti in connection with the Technical Assistance assignment of M. Routh (U.K.). Detailed plans have been drawn up for tests of models of 90-ft. fishing boats in Tokyo, Japan.

Dr. W.F. Hampton, Chief, Fish Processing Section, left headquarters on 10 May for the FAO Fisheries Mission in Chile for three months. The Mission, headed by J. d'Alarção, FAO fishery economist, is investigating the actual and potential role of the fishing industry in the economy of Chile. It will attempt to identify factors limiting production and marketing, and a national plan for fisheries development will be drafted. Dr. Hampton will be responsible for studies and recommendations relative to technological aspects of production, processing and distribution.

En route to Chile, Dr. Hampton attended the annual meeting of the American Institute of Food Technologists in Pittsburgh, Pennsylvania, U.S.A., from 12 to 16 May. He also visited New York to confer with UNICEF officials on problems connected with fish processing and the manufacture of fish flour.

Technical Assistance

In February 1957, Dr. C.J.D. Brown (U.S.A.) completed 10½-month survey of the inland waters and fisheries resources of Paraguay, and returned to his duties as professor at Montana State College, U.S.A.

Dr. H-J. Elster (Germany), inland fisheries biologist in Egypt, was joined in March 1957 by a UNESCO expert, Dr. R.A. Vollenweider, who will conduct studies with the use of radio-isotopes, on the basic productivity of Egyptian lakes.

S.Y. Lin (China), who has been working in both Guatemala and Honduras, has proceeded to El Salvador for a short period, in connection with a new inland fisheries project. All three projects are now under his direction.

Other technical assistance projects in inland fisheries continue in Ceylon and Syria.

Projects in marine fisheries continue in Brazil, Indonesia, the Philippines, Turkey and Venezuela. K.F.W. Tiews (Germany), technical assistance expert working in the Philippines, attended the 7th Session of the Indo-Pacific Fisheries Council in Bandung, where he met fisheries workers of the region.

Karsten Hoydal (Faroe Islands, Denmark), was at Headquarters to complete the final report on his 2½ years' assignment in Ecuador as fisheries technologist. During his mission he advised and assisted the Government in the establishment of a pilot fish salting and drying station and fish meal plant at Manta. He also helped in the planning of a freezing and cold storage plant.

P.A. Lusyne (Belgium), fisheries training center specialist, has completed his 18 months' assignment to India. The first training center was set up under his guidance at Satpati, Bombay State, soon followed by others at Veraval, Cochin and Tuticorin. The courses last for six months, during which time the trainees — master fishermen and certain government employees — learn to make and operate several types of modern fishing gear, and to operate and maintain marine engines; they also study elementary navigation and take turns as skippers on the training boats.

M. Routh (U.K.), returned to his assignment in Haiti on 1 May, having completed his interim report at headquarters. Having demonstrated the existence of commercial stocks of tuna around Haiti, he will now advise and assist in plans to develop the fisheries on a commercial basis. He has taken back with him the design for a 45-ft. tuna fishing vessel, prepared by the Fishing Boat Section.

Ragnar Gudmundsson (Iceland), master fisherman, has completed his 2-year assignment in Turkey and a final report on his and J. Einarsson's work has been prepared at headquarters. Mr. Gudmundsson introduced improvements in the Turkish two-boat "girgir" purse seining equipment and method for taking anchovy and bonito, e.g., the use of winches and bow-davits for pursing. Mr. Gudmundsson later supervised fishing operations with the Pacific-type purse seiner *Sasan*. A Turkish crew has now been trained to operate efficiently the big mechanically handled Pacific-type purse seine and the *Sasan* got excellent catches of anchovy off the Turkish Black Sea coast during April, with sets of up to 20 to 30 tons. Mr. Gudmundsson also had excellent results with mid-water trawling for anchovy — 2 to 4 tons per hour using an ordinary Danish wing-trawl which he rigged for

mid-water fishing from one boat, using otter boards. This fishing method had never been used before in Turkey but seems to be very efficient for taking anchovy off the Black Sea coast, which are often found too deep in water to be taken with purse seines.

Jón Saemundsson (Iceland), master fisherman, has completed his second year in Ceylon and has written a final report on his project. He has successfully introduced the use of bottom-set nylon gill nets which have proved to be exceptionally productive and which have been eagerly adopted by the fishermen in northern Ceylon to whom they have been demonstrated. The gill nets can be operated from the available local craft and have proved to multiply the fish landings of those fishermen who have so far been able to buy nets. Consequently, the use of nylon gill nets is now rapidly spreading and several hundred nets have already been imported through normal commercial channels. Mr. Saemundsson also found high opening light trawls to be very efficient for taking small species, such as silverbellies, in shallow water off the north coast. Catches of 500 to 1,000 lb. (227.2 to 454.4 kg.) per hour were taken in some areas, when the trawl was towed with a 36 h.p. open boat. Experimental purse seining also yielded encouraging results with individual sets of up to 20,000 lb. (9,070 kg.).

The introduction of these fishing methods works hand-in-hand with the spread of mechanization of fishing boats in Ceylon, which is proceeding steadily under the supervision of Einar Kvaran (Iceland), marine engineer.

Carl Gustaf Bjuke, Sr. (Sweden), senior fishing port specialist, has completed his second assignment with the Central Government of India. His interim report covers proposals for fishing harbors at Veraval, on which work has already started, and at Bombay, Nagapattinam and Cuddalore.

H.I. Chapelle (U.S.A.) has prepared a final report on his 12-month assignment in Turkey as naval architect, where he has been advising the Government on improving the design and construction of local types of fishing boats and on problems of mechanization. He particularly considered the possibilities of developing the good types of Turkish boats, which would need relatively small adjustments.

Other projects continue in Brazil, Ceylon, India, the Philippines, the Sudan and Thailand.

Publications

The second edition of *Fishing Boats of the World* (technical material from the papers and discussions of the FAO International Fishing Boat Congress 1953) is shortly to be published by Messrs. Arthur J. Heighway Publications Ltd.

Also planned for issuance shortly is Part II of the *Fishing Boat Tank Tests*.

Economics and Statistics Branch

F.E. Popper, Chief of the Economics and Statistics Branch, attended the OEEC Working Party (Fish) in Geneva, from 2 to 4 April. There, he had discussions with the Co-operation and Handicrafts Division of ILO, regarding the FAO Training Center on Fishery Co-operatives and Administration to be held in Sydney and Adelaide, Australia, 16 December 1957 to 25 January 1958.

In Lisbon, Portugal, during May 1957, Mr. Popper attended the 7th Annual Meeting of the International Commission for the Northwest Atlantic Fisheries, which included meetings of the ICNAF Committee of Research and Statistics.

C. Beever, FAO fishery economist, attended the IPFC Meeting in Bandung. En route he visited Karachi, New Delhi and Calcutta, for discussions with government fishery authorities regarding current technical assistance in fish marketing and certain economic research investigations. From Bandung he proceeded to Sydney and Canberra where he assisted in preparations for the forthcoming FAO Indo-Pacific Training Center in Fishery Co-operatives and Administration and, in the same connection, returned to Rome via Canada to contact Mr. A. H. MacDonald, Director of Fisheries, Saskatchewan, who will be the FAO Associate Director of the Center. En route he also called at Seattle and Vancouver to learn of recent fishery developments of interest to FAO, especially in regard to statistics, marketing and co-operatives, and London for discussions with Mr. T. S. Leach, M.C., Chief Inspector of Fisheries in the Ministry of Agriculture, Fisheries and Food.

Statistical Methods and Surveys

K.V.R. Sastry (India), fishery statistician, who, in 1956, was working in Egypt, assisting the Government in improving the collection of fisheries statistics through the employment of sampling methods, has carried out a short-term assignment of four months in the Protectorate of Uganda, where he has advised the local fisheries authorities and the Lake Victoria Fisheries Service of the East Africa High Commission, on the use of sampling methods in the collection of production statistics, particularly on Lakes Victoria and Kyoga. He has also discussed the possibilities of applying similar methods to improve statistics of production from Lakes Albert and Edward.

Economic Survey

D. Quiroga Rios (Spain), on completion of a two-year mission in Ecuador, has been transferred to an assignment with the Central American Integration Scheme (CAIS). He left Quito in April 1957 on a survey tour of the Central American countries — Costa Rica, Nicaragua, Honduras, San Salvador and Guatemala. After

home leave, he returns to Central America in September of this year to advise and assist the CAIS participating governments: (a) in appraising their marine and fresh-water fisheries, and the contribution they may be expected to make to the development programs of CAIS; (b) in identifying obstacles to development in production, handling, processing, distribution and consumption, as well as in fisheries administration, in order to help formulate a comprehensive fishery policy in each country; (c) in estimating the technical assistance required by the Governments to plan and carry out an over-all, co-ordinated regional plan of fishery development within the terms of reference of CAIS.

Publications

Studies and Reviews. The Executive Committee of the General Fisheries Council for the Mediterranean has decided to issue, in a series of occasional publications entitled *Studies and Reviews*, documents which could not be inserted in *Proceedings and Technical Papers*, but which nevertheless warrant more permanent status and wider distribution than given to meeting papers.

Accordingly, certain working papers prepared for meetings of the GFCM, or certain studies or results of surveys undertaken at the request of the Council by specially designated experts, by the FAO, or by the Secretariat, will appear in this mimeographed series.

No. 1 is entitled "Standardization of Biometric and Observation Methods for Clupeidae (especially *Sardina pilchardus*) used in Fisheries Biology." This study, prepared by the FAO Fisheries Biology Branch, is based on notes presented to the 4th Meeting of the GFCM by Mario Ruivo of the Institute of Marine Biology, Cais do Sodré, Lisbon, Portugal, and is available in English, French and Spanish.

Copies will be supplied on request, without charge.

FAO Fisheries Study. Fishermen's Organizations and the Regulation of Fish Prices in Sweden, FAO Fisheries Study No. 4, by Christian Hessle and Sigmund Verstandig, has been published in English, French and Spanish (Price: \$1.00 or 5s.). A summary of this monograph appeared in *FAO Fisheries Bulletin*, IX (3): 130-43.

New Publications

Book Note

FOWLER, H.W. *Fishes of the Red Sea and Southern Arabia*. The 1956 Weizman Science Press of Israel, P.O.B. 801, Jerusalem. 240 pp., figs., index. In English.

This taxonomic work by the Curator of Fishes of the Academy of Natural Sciences of Philadelphia, U.S.A., contains keys to orders, families, genera and species, and descriptions of orders, suborders, families and species. A citation of the original reference and the type locality of each species, distributional references and regional synonyms, are included.

The book also covers the Arabian Sea and its shores, including the Gulf of Oman and the Persian Gulf.

Vols. II (Percida) and III (Dactylopterida to Lophiida, Fresh-water Fishes), are in preparation.

First Issues

Report of the Institute of Fishery Biology of the Ministry of Economic Affairs and the National Taiwan University. (The Institute of Fishery Biology, 89 Sec. III, South Sin Sun Road, Taipei, Taiwan, (Formosa). Vol. 1, No. 1, November 1956. Illus. In English, with summaries in Chinese.

Contains four papers:

F.H. LIU and I.S. TUNG. "Distribution and Fluctuation of Ten Important Demersal Fishes of the Northern Trawling Ground of Taiwan."

K.Y. CHU. "A Review of Sciaenoid Fishes of Taiwan."
EUGENE Y.F. SHEN. "Studies on the Fresh-water Algae of Taiwan, Scenedesmaceae from Taiwan."

F.H. LIU and G.C. CHEN. "Studies on the Black Croaker (*Argyrosomomus* Nibe J. & T.) of the Northern Trawling Grounds of Taiwan."

Queensland Fisheries Information Bulletin, Department of Harbours and Marine. Brisbane, Queensland. No. 1, January 1957. 6 sheets. Monthly. In English.

This bulletin has been issued with a view to bringing the information received in the Fisheries Section of the Department to a wider audience. It is hoped eventually to expand this publication.

Argonauta, una publicación juvernil de Mexico Marítima para los amigos del mar. Mario Gutiérrez, Apartado Postal Núm. 10429, Mexico 1, D.F. Monthly. In Spanish.

A journal for children.

Calendar of Meetings

August-December 1957

August	4-7	International Co-operative Alliance	Stockholm
"	5-9	ECE - Working Party on Statistical Information	Geneva
"	8-15	International Statistical Institute - 30 Meeting	Stockholm
"	19-29	ECAFE - Working Party on Inland Ports	Bangkok
"	24-29	American Society of Limnology and	Palo Alto, Cal.,
"	26-28	ECE - Subcommittee on Inland Water Transport	Geneva
		Oceanography - Annual Meeting *	U.S.A.
August	28	International Congress on Cell Biology -	St. Andrew's
to September	3	9th	(Scotland)
"	29-30	ECE - Working Party on River Law (Convention on Collisions)	Geneva
August		Inter-American Economic Conference (OAS)	Buenos Aires
"		International Association of Physical Oceanography	(Canada)
"		International Society of Bioclimatology and Biometeorology - 1st Congress	Vienna
September	1-3	Economic Commission for Europe (ECE) - Working Party on the Standardization of Fish	Geneva
"	1-5	International Union for the Conservation of Nature - General Assembly	Athens
"	3-6	American Society of Limnology and Oceanography - Special Meeting *	Woods Hole, Mass., U.S.A.
"	3-14	International Union of Geodesy and Geophysics - 11th General Assembly	Toronto
"	7-10	Symposium on the Behavior of Ships in a Seaway	Wageningen, The Netherlands
"	9-20	UNESCO - International Conference on Radio-isotopes in Scientific Research	Paris
"	11-13	American Fisheries Society - 87th Annual Meeting *	Las Vegas, U.S.A.
"	13-23	International Towing Tank Conference - 8th	Madrid
September	23-27	International Society of Bioclimatology and Biometeorology - 1st Congress	Vienna
"	16-28	FAO/ECAFE Joint Working Party on Agricultural Development and Planning	Bangkok
"	26-27	Meeting of Consultants on International Oceanographic Expeditions and Research Vessels	Bergen
"	27	Symposium on Measurement of Primary Production in the Sea (ICES/UNESCO)	Bergen
"	27	International Fisheries Trade Fair - 2nd	Copenhagen
to October	6		
September	30	International Council for the Explora-	Bergen

* National meetings only

to October September	8	tion of the Sea (ICES) - 45th Meeting International Union for the Conserva- tion of Nature - Ecological Commis- sion	Venice ?
October	7-12	FAO - International Fishing Gear Con- gress	Hamburg
"	8-11	ECE - Working Party on Standardiza- tion of Perishable Foodstuffs	Geneva
"	20	Pan-Indian Ocean Science Congress - 3rd Session	Tananarive, Madagascar
"	21	Commission for Technical Co-operation in Africa South of the Sahara - Inter- African Statistics Conference	Laurenço Marques
"	21-25	Committee on Commodity Problems - 29th Session	Rome
September	21-26	International Fisheries Exhibition	Lowestoft, England
"	22	Permanent Commission of the Inter- national Fisheries Convention (1946) - 6th Meeting	London
"	28	World Meteorological Association (WMO) - Seminar on Hydrological Forecasting and the Water Balance in the Medi- terranean and Southwest Asia Areas	Belgrade
"	28-31	FAO Council - 27th Session	Rome
October		UN Scientific Committee on the Effects of Atomic Radiation	
November	2-22	FAO Conference - 9th Session	Rome
"	4-9	Experimental Center of Refrigeration - 2nd General Assembly *	Vigo
"	5-8	International Permanent Committee on Canned Foods (CIPC) - 1957 Meeting	Paris
"	9	Inter-Agency Working Group on Water Development	New York
"	11-15	Gulf and Caribbean Fisheries Institute - 10th Annual Meeting	Miami Beach, Fla., U.S.A.
"	12-13	UNESCO - Meeting of Representatives of Marine Science Institutes in the Indo-Pacific Region	Bangkok
"	15, 16 18	UNESCO - International Advisory Com- mittee on Marine Sciences - 2nd Meeting	Bangkok
"	18	Pacific Science Congress - 9th	Bangkok
to December	9		
November	20-27	Commission for Technical Co-operation in Africa South of the Sahara - West Africa Conference on Sea Fisheries	Luanda, Angola
November		UNESCO - International Symposium on the Migrations of Fishes	Havana, Cuba
November		Caribbean Fisheries Seminar - 3rd	
November		Inter-American Statistical Institute - Committee on Improvement of Na- tional Statistics - 4th Session	
December	22-29	ISI (Indian Standards Convention) - 3rd Meeting	Madras, India

FAO Training Centers

October to December	21 14	Latin American Fish Processing Train- ing Center	Lima, Peru
December to January 1958	16 25	Indo-Pacific Training Center on Fishery Co-operatives and Administration	Sydney and Ade- laide, Australia

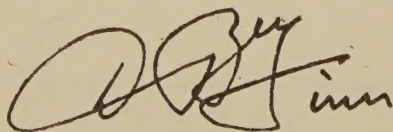
FINAL ISSUE OF FAO FISHERIES BULLETIN

With this issue of the FAO Fisheries Bulletin the publication ceases. The FAO Fisheries Bulletin was designed to bring to interested people, at regular periods, reviews of knowledge and accounts of recent advances having bearing on fisheries development, as well as incidental news about FAO and its work.

During the past decade fisheries have grown in importance and there is a new awareness on the part of governments of the role that fisheries are playing — and will play — in nutrition and in trade. Many notable advances are being made in fisheries, such as the application of science to the measurement of the potential resource, advances in technology, in harvesting and handling fish, rationlization of methods of distribution of fish and fish products, and social adjustments that are necessary as a consequence of these advances. All such developments bring new tasks to FAO in this progress in fisheries from "hunting" to "husbandry." Such an additional load of work has enforced the Organization to seek for new efficiencies and economies so that as much as possible may be done with the money that FAO has at its disposal. This policy, we regret to announce, has led to the decision to cease publishing the FAO Fisheries Bulletin.

FAO is mindful of one of its principal functions, that of collecting and disseminating information and of the importance of this function to fostering expansion and development. The FAO Fisheries Bulletin has played a part in this and its disappearance will leave a gap. However, it is planned to continue to issue authoritative statements on recent advances in fisheries development in a non-periodical series of fisheries papers.

These papers may be obtained by all those who are interested in fisheries by writing to the Director of Fisheries Division, Food and Agriculture Organization, Viale delle Terme di Caracalla, Rome, Italy, and requesting to be placed on the distribution list.



D. B. FINN

Director, Fisheries Division

